

REMARKS

Applicant hereby responds to the Final Office Action of July 16, 2008, in the above-referenced patent application. Applicant thanks the Examiner for carefully considering the application.

Status of Claims

After this amendment, claims 1, 4, 5, 7, 9-11, 13-19, 21-28, 37, 49-51, 53-56, 60 and 61 are pending in the above-referenced patent application. Claims 1, 4, 37, 49, 50, 53, 54, 55, 56, 60 and 61 are independent. Claims 2, 3, 6, 8, 12, 29-36, 38-48, 52, 57-59, were withdrawn from consideration.

Claims 1, 4-5, 7, 9-11, 13, 15, 16, 18, 19, 24-25 and 37 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,272,261 (“Matsuoka”) in view of U.S. Patent No. 6,128,398 (Kuperstein) and U.S. Patent Pub. No. 2004/0184657 issued for Lin et al. (“Lin”). Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Matsuoka and Kuperstein in view of an article by Garard de Haan (“Garard de Haan”). Claims 17 and 20-23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Matsuoka and Kuperstein in view of U.S. Patent Application Pub. No. 2001-0031100 (“Rising III”). Claims 27 and 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Matsuoka and Kuperstein. Claim 49 was rejected under 35 U.S.C. §103(a) as being unpatentable over Matsuoka and Kuperstein in view of U.S. Patent No. 5,815,198 (“Vachtsevanos”). Claims 50-51, 53-56 and 60-61 were rejected under 35 U.S.C. §103(a) as being unpatentable over Matsuoka and

Kuperstein in view of U.S. Patent No. 4,468,688 (“Gabriel”).

Claim Amendments

Claims 1, 4, 15, 23-24, 37, 49-50, 53-56 and 60-61 have been amended for clarification.

No new matter has been added by way of these amendments.

Rejection under 35 U.S.C. §103(a)

Claims 1, 4-5, 7, 9-11, 13, 15, 16, 18, 19, 24-25 and 37

Rejection of the claims 1, 4-5, 7, 9-11, 13, 15, 16, 18, 19, 24-25 and 37 is respectfully traversed because, for at least the following reasons, Matsuoka, Kuperstein and Lin, whether considered separately or in combination, fail to show or suggest all of the claimed limitations.

According to MPEP §2142,

[t]he key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1396 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that ‘rejections on obviousness cannot be sustained with mere conclusory statements; instead there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’ *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). See also *KSR*, 550 U.S. at ___, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval).

Further, according to MPEP §2143, “[T]he Supreme Court in *KSR International Co. v. Teleflex, Inc.* 550 U.S. ___, ___, 82 USPQ2d 1395-1397 (2007) identified a number of rationales to support a conclusion of obviousness which are consistent with the proper “functional

approach” to the determination of obviousness as laid down in *Graham*.” And, according to MPEP §2143.01, [o]bviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1335 (Fed. Cir. 2006). Further, “[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art.” *KSR International Co. v. Teleflex, Inc.* 550 U.S. ___, ___, 82 USPQ2d 1385, 1396 (2007). Additionally, according to MPEP §2143,

[a] statement that modification of the prior art to meet the claimed invention would have been “well within the ordinary skill of the art at the time the claimed invention was made” because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Pat. App. & Inter. 1993).

The claimed invention is directed to image deinterlacing using interpolation neural networks. Independent claim 1 requires, in part, “using a dedicated interpolation neural network for each of a plurality of different edge directions to provide an interpolated value of the *interlaced image*” (emphasis added). Independent claim 4 requires in part “determining *an edge direction of an interlaced image* at a location within the interlaced image where interpolation is desired; selecting an interpolation neural network based upon the determined edge direction; and *interpolating a value of the interlaced image at the location using the selected interpolation neural network*” (emphasis added). And independent claim 37 requires in part “a dedicated *interpolation neural network configured to provide an interpolated value for each of a plurality*

of different edge directions in the interlaced image” (emphasis added).

Matsuoka discloses using a neural network that selects different filters that are suited for edge areas and non-edge areas (see Matsuoka, Abstract; col. 6, lines 14-16, Fig. 7). It is clear that the neural network used in Matsuoka is not an *interpolation neural network*, as required by Applicant’s claimed invention (independent claims 1, 4 and 37), because Matsuoka only discloses different filtering neural networks. Matsuoka further discloses a deinterlaced image where a portion of the deinterlaced image is used as input (see, e.g., Matsuoka, Figs. 2A-C, 3, 5A-C, 8). Applicant notes that the definition of interlaced as related to images is to vary by alternation (see, e.g., Merriam-Webster’s online dictionary). Therefore, an interlaced image only included every other scan line of pixels. That is, between scan lines is a missing scan line or empty space. Distinguishable, the input images of Matsuoka do have columns and rows of pixels that are adjacent one another (i.e., the pixel rows and columns do not alternate with an empty space or empty scan line).

Further, Matsuoka uses the deinterlaced image, selects a portion of that deinterlaced image, then interpolates in order to provide additional pixels for enlargement and high-resolution conversion maintaining a deinterlaced image from input to output. Distinguishable, Applicant’s claimed invention uses an interlaced input image and converts the interlaced image to a deinterlaced image using an interpolation neural network. Moreover, the neural network used in Matsuoka simply outputs a particular type of interpolation to use. That is, the neural network in Matsuoka is a filtering neural network. In contrast, the neural network in Applicant’s claimed

invention outputs an interpolated value, not the type of interpolation to use. Thus, Applicant's claimed invention uses an *interpolation neural network*.

Kuperstein discloses a pattern recognition system that uses five neural networks that are used to find x and y coordinates (i.e., location) of a person's eyes having the mean gaze in the selected band (Kuperstein, col. 8, lines 19-24). It is clear that the neural network used in Kuperstein is not an *interpolation neural network*, as required by Applicant's claimed invention (independent claims 1, 4 and 37), because Kuperstein only discloses different coordinate determining neural networks. Moreover, Kuperstein does not use an interlaced image as an input nor convert the interlaced image into a deinterlaced image by using an interpolation neural network.

Lin discloses conversion of an original image to a high-resolution image using either an interpolation neural network or non-linear interpolation. This is different than the way Matsuoka uses a neural network where the type of interpolation is output based on learning. That is, in Matsuoka, the better type of interpolation is determined from the neural network output. Therefore, combining Lin with Matsuoka would change the principle of operation (see MPEP 2143.01 VI, "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)). Moreover, nowhere in Lin is it taught that an original interlaced image is converted to a deinterlaced image by using an interpolation neural network.

Even if Matsuoka is combined with Kuperstein and Lin (which Applicant believes is not legally combinable with Matsuoka and Kuperstein), the result would still not teach, disclose or suggest Applicant's independent claim 1 limitations of "using a dedicated *interpolation neural network* for each of a plurality of different edge directions to provide an interpolated value of the *interlaced image*" (emphasis added), independent claim 4 limitations of "selecting an *interpolation neural network* based upon the determined edge direction; and interpolating a value of the *interlaced image* at the location using the selected *interpolation neural network*" (emphasis added), or independent claim 37 limitations of "system comprising a dedicated *interpolation neural network* configured to provide an interpolated value for each of a plurality of different edge directions in the *interlaced image*" (emphasis added).

Further, the assertions made in the Office Action on pages 5-11 that lead to a conclusion of obviousness are not explicit and the basic requirements of an articulated *rationale* under MPEP §2143 cannot be found. Additionally, since neither Matsuoka, Kuperstein, Lin, and therefore, nor the combination of the three, teach, disclose or suggest all the limitations of Applicant's claims 1, 4 and 37, as listed above, Applicant's claims 1, 4 and 37 are not obvious over Matsuoka in view of Kuperstein and Lin since a *prima facie* case of obviousness has not been met under MPEP §2142. Thus, claims 1, 4 and 37 of the present application are patentable over Matsuoka, Kuperstein and Lin for at least the reasons set forth above. Additionally, the claims that directly or indirectly depend on amended claim 4, namely claims 5, 7, 9-11, 13, 15, 16, 18, 19, 24-25, are allowable for at least the same reasons.

Regarding dependent claim 7, Matsuoka further fails to disclose “selecting an interpolation neural network comprises the steps of *determining which of a plurality of different interpolation neural networks is most closely associated with the determined edge direction*” (emphasis added). The combined teachings of Matsuoka, Kuperstein and Lin do not teach, disclose or even suggest selecting an interpolation neural network. Thus, claim 7 is patentable over Matsuoka in view of Kuperstein for at least these reasons.

Regarding dependent claims 9-11, Applicant respectfully submits that the combined teachings of Matsuoka, Kuperstein and Lin further fails to disclose “selecting *an interpolation neural network* comprises the steps of mirroring a data set to facilitate use of a common neural network for symmetric edge directions” (claim 9), “selecting *an interpolation neural network* comprises the steps of vertically mirroring a data set to facilitate use of a common neural network for symmetric edges” (claim 10), and “selecting *an interpolation neural network* comprises the steps of selecting a substantially linear neural network with one neuron” (claim 11). The combined teachings of Matsuoka, Kuperstein and Lin do not teach, disclose or even suggest selecting an interpolation neural network. Thus, claims 9-11 are patentable over Matsuoka in view of Kuperstein and Lin for at least the above asserted reasons.

Regarding dependent claims 24-25, Applicant respectfully submits that the combined teachings of Matsuoka, Kuperstein and Lin further fails to disclose “inputs to the selected *interpolation neural network* comprise values of neighboring portions of the *interlaced image*”

with respect to the location where interpolation is desired” (claim 24), and “inputs to the selected *interpolation neural network* comprise values of neighboring pixels with respect to a pixel at the location where interpolation is desired” (claim 11). The combined teachings of Matsuoka, Kuperstein and Lin do not teach, disclose or even suggest selecting an interpolation neural network. Thus, claims 24-25 are patentable over Matsuoka in view of Kuperstein and Lin for at least the above asserted reasons.

Accordingly, withdrawal of the rejection of claims is respectfully requested.

Claim 14

Rejection of claim 14 is respectfully traversed because, for at least the following reasons, Matsuoka, Kuperstein and Garad de Haan, whether considered separately or in combination, fail to show or suggest all of the claimed limitations.

Applicant’s claim 14 directly depends on amended independent claim 4. As discussed above, Matsuoka in view of Kuperstein fails to teach, disclose or suggest the limitations in claim 4 of “*selecting an interpolation neural network* based upon the determined edge direction; and interpolating a value of the *interlaced image* at the location using the selected *interpolation neural network*” (emphasis added). Garad de Haan, like Matsuoka discussed above, also fails to show or suggest such a limitation, and thus fails to supply that which Matsuoka and Kuperstein lack. This is also evidenced by the fact that Garad de Haan was relied upon in the instant Office Action merely to supply deinterlacing.

Further, the assertions made in the Office Action on page 12 that lead to a conclusion of obviousness are not explicit and the basic requirements of an articulated *rationale* under MPEP §2143 cannot be found. Additionally, since neither Matsuoka, Kuperstein, Garad de Haan, and therefore, nor the combination of the three, teach, disclose or suggest all the limitations of Applicant's claim 4, as listed above, Applicant's claim 4 is not obvious over Matsuoka in view of Kuperstein and Garad de Haan since a *prima facie* case of obviousness has not been met under MPEP §2142. Thus, claim 4 of the present application are patentable over Matsuoka, Kuperstein and Garad de Haan for at least the reasons set forth above. Additionally, the claim that directly depends on amended claim 4, namely claim 14, is allowable for at least the same reasons.

In view of the above, claim 14 is patentable over Matsuoka and Kuperstein in view of Garad de Haan for at least the reasons set forth above.

Accordingly, withdrawal of the rejection of claim 14 is respectfully requested.

Claims 17 and 20-23

Rejection of claims 17 and 20-23 is respectfully traversed because, for at least the following reasons, Matsuoka and Kuperstein in view of Rising III, whether considered separately or in combination, fail to show or suggest all of the claimed limitations.

Applicant's claims 17 and 20-23 directly depend on Applicant's amended independent

claim 4. As discussed above, Matsuoka and Kuperstein fail to show or suggest the limitations in claim 4 of “*selecting an interpolation neural network* based upon the determined edge direction; and interpolating a value of the *interlaced image* at the location using the selected *interpolation neural network*” (emphasis added). Rising III, like Matsuoka and Kuperstein discussed above, also fails to show or suggest such a limitation, and thus fails to supply that which Matsuoka and Kuperstein lack. This is also evidenced by the fact that Rising III was relied upon in the instant Office Action merely to supply interpolation details.

Further, the assertions made in the Office Action on pages 13-14 that lead to a conclusion of obviousness are not explicit and the basic requirements of an articulated *rationale* under MPEP §2143 cannot be found. Additionally, since neither Matsuoka, Kuperstein, Rising III, and therefore, nor the combination of the three, teach, disclose or suggest all the limitations of Applicant's claim 4, as listed above, Applicant's claim 4 is not obvious over Matsuoka in view of Kuperstein and Rising III since a *prima facie* case of obviousness has not been met under MPEP §2142. Thus, claim 4 of the present application are patentable over Matsuoka, Kuperstein and Rising III for at least the reasons set forth above. Additionally, the claim that directly depends on amended claim 4, namely claim 17 and 20-23, are allowable for at least the same reasons.

In view of the above, claims 17 and 20-23 are patentable over Matsuoka and Kuperstein in view of Rising III for at least the reasons set forth above.

Accordingly, withdrawal of the rejection of claims 17 and 20-23 is respectfully requested.

Claims 27 and 28

Rejection of claims 27 and 28 is respectfully traversed because, for at least the following reasons, Matsuoka and Kuperstein fail to show or suggest all of the claimed limitations.

Applicant's claims 27 and 28 directly depend on Applicant's amended independent claim 4. As discussed above, Matsuoka and Kuperstein fail to show or suggest the limitations in claim 4 of "*selecting an interpolation neural network* based upon the determined edge direction; and interpolating a value of the *interlaced image* at the location using the selected *interpolation neural network*" (emphasis added).

Further, the assertions made in the Office Action on page 15 that lead to a conclusion of obviousness are not explicit and the basic requirements of an articulated *rationale* under MPEP §2143 cannot be found. Additionally, since neither Matsuoka, Kuperstein, and therefore, nor the combination of the two, teach, disclose or suggest all the limitations of Applicant's claim 4, as listed above, Applicant's claim 4 is not obvious over Matsuoka in view of Kuperstein since a *prima facie* case of obviousness has not been met under MPEP §2142. Thus, claim 4 of the present application are patentable over Matsuoka and Kuperstein for at least the reasons set forth above. Additionally, the claims that directly depend on amended claim 4, namely claim 27 and 28, are allowable for at least the same reasons.

In view of the above, claims 27 and 28 are patentable over Matsuoka and Kuperstein for

at least the reasons set forth above.

Additionally, the combined teachings of Matsuoka and Kuperstein fail to teach, disclose or suggest Applicant's claim 27 requires "between approximately 40 and approximately 80 samples are provided as *inputs to the interpolation neural network*" (emphasis added), and claim 28 requires "approximately 60 samples are provided on *inputs to the interpolation neural network*" (emphasis added).

Accordingly, withdrawal of the rejection of claims 27 and 28 is respectfully requested.

Claim 49

Rejection of claim 49 is respectfully traversed because, for at least the following reasons, Matsuoka and Kuperstein in view of Vachtsevanos, whether considered separately or in combination, fail to show or suggest all of the claimed limitations.

As discussed above, Matsuoka and Kuperstein fails to show or suggest "*detecting an edge direction of the interlaced image at a selected point on the omitted scan line, selecting an interpolation neural network based upon the detected edge direction*, and using the interpolation neural network to provide an interpolated value for the selected point." (emphasis added), as required by amended independent claim 49. Vachtsevanos, like Matsuoka and Kuperstein discussed above, also fails to show or suggest such a limitation, and thus fails to supply that which Matsuoka and Kuperstein lack. This is also evidenced by the fact that Vachtsevanos was

relied upon in the instant Office Action merely to supply omitted scan line and interlaced image. However, Applicant notes that the term “interlace” as it pertains to Vachtsevanos has a different meaning to an ordinary person skilled in the art. That is, the Examiner’s citation refers to *textiles*. In the technology of textiles, the term interlaced has an ordinary meaning of lacing together (see, e.g., the Merriam-Webster on-line dictionary).

Moreover, by viewing the disclosures of Matsuoka and Kuperstein in view of Vachtsevanos, one cannot jump to the conclusion of obviousness without impermissible hindsight. Applicant submits that without first reviewing Applicant’s disclosure, no thought, whatsoever, would have been made to “*detecting an edge direction of the interlaced image at a selected point on the omitted scan line, selecting an interpolation neural network based upon the detected edge direction, and using the interpolation neural network to provide an interpolated value for the selected point.*” (emphasis added).

Further, the assertions made in the Office Action on page 16 that lead to a conclusion of obviousness are not explicit and the basic requirements of an articulated *rationale* under MPEP §2143 cannot be found. Additionally, since neither Matsuoka, Kuperstein, Vachtsevanos, and therefore, nor the combination of the three, teach, disclose or suggest all the limitations of Applicant's claim 49, as listed above, Applicant's claim 49 is not obvious over Matsuoka in view of Kuperstein and Vachtsevanos since a *prima facie* case of obviousness has not been met under MPEP §2142. Thus, claim 49 of the present application are patentable over Matsuoka, Kuperstein and Vachtsevanos for at least the reasons set forth above.

In view of the above, claim 49 is patentable over Matsuoka and Kuperstein in view of Vachtsevanos for at least the reasons set forth above.

Accordingly, withdrawal of the rejection of claim 49 is respectfully requested.

Claims 50-51, 53-56 and 60-61

Rejection of claims 50-51, 53-56 and 60-61 is respectfully traversed because, for at least the following reasons, Matsuoka and Kuperstein in view of Gabriel, whether considered separately or in combination, fail to show or suggest all of the claimed limitations.

As discussed above, Matsuoka and Kuperstein fail to teach disclose or suggest “selecting an *interpolation neural network*,” “deinterlacing an interlaced image, or using an interlaced input image, as required by independent claims 50, 55, 56, 60, and 61 . Accordingly, Matsuoka and Kuperstein also fail to teach, disclose or suggest “an *interpolation neural network selector*” (emphasis added), nor deinterlacing an *interlaced image*, as required by independent claims 53 and 54. Gabriel, like Matsuoka and Kuperstein discussed above, also fails to show or suggest such a limitation, and thus fails to supply that which Matsuoka and Kuperstein lack. This is also evidenced by the fact that Gabriel was relied upon in the instant Office Action merely to supply interpolation details.

Moreover, by viewing the disclosures of Matsuoka and Kuperstein in view of Gabriel, one cannot jump to the conclusion of obviousness without impermissible hindsight. Applicant submits that without first reviewing Applicant's disclosure, no thought, whatsoever, would have been made to selecting an *interpolation neural network*.

Further, the assertions made in the Office Action on pages 17-23 that lead to a conclusion of obviousness are not explicit and the basic requirements of an articulated *rationale* under MPEP §2143 cannot be found. Additionally, since neither Matsuoka, Kuperstein, Gabriel, and therefore, nor the combination of the three, teach, disclose or suggest all the limitations of Applicant's claims 50, 53, 54, 55, 56, 60 and 61, as listed above, Applicant's claim s 50, 53, 54, 55, 56, 60 and 61 are not obvious over Matsuoka in view of Kuperstein and Gabriel since a *prima facie* case of obviousness has not been met under MPEP §2142. Thus, claim s 50, 53, 54, 55, 56, 60 and 61 of the present application are patentable over Matsuoka, Kuperstein and Gabriel for at least the reasons set forth above.

In view of the above, independent claims 50, 53, 54, 55, 56, 60, and 61 are patentable over Matsuoka and Kuperstein in view of Gabriel for at least the reasons set forth above. Additionally, since claim 51 directly depends on independent claim 50, claim 51 is allowable for at least the same reasons.

Accordingly, withdrawal of the rejection of claims 50-51, 53-56 and 60-61 is respectfully requested.

Rejoinder

As discussed above, independent claim 4 is allowable. Thus, dependent claims 6, 8, 12, 29-36 should be allowable for at least the same reasons. Accordingly, rejoinder of withdrawn claims 6, 8, 12, 29-36 is respectfully requested.

CONCLUSION

In view of the foregoing amendments remarks, Applicant respectfully requests that the rejections of the claims be withdrawn, and that the case be passed to issue. If the Examiner feels that a telephone interview would be helpful to the further prosecution of this case, Applicant respectfully requests that the undersigned attorney be contacted at the listed telephone number.

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Respectfully submitted,

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